



Docket No.: 1309.43471X00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

Ikuo URATANI et al.

Serial No. 10/769,784

Filed: February 3, 2004

For: DISK ARRAY APPARATUS, AND METHOD FOR CONTROLLING
THE SAME

**PETITION TO MAKE SPECIAL
UNDER 37 CFR §1.102(MPEP §708.02)**

April 22, 2005

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants hereby petition the Commissioner to make the above-identified application special in accordance with 37 CFR §1.102(d). Pursuant to MPEP §708.02(VIII), Applicants state the following.

(A) This Petition is accompanied by the fee set forth in 37 CFR §1.17(h). The Commissioner is hereby authorized to charge any additional payment due, or to credit any overpayment, to Deposit Account No. 50-1417.

(B) All claims are directed to a single invention. If the Office determines that all claims are not directed to a single invention, Applicant will make an election without traverse as a prerequisite to the grant of special status.

04/25/2005 HAL111 00000021 10769784

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(C) A pre-examination search has been conducted.

The search was directed to the invention set forth in claims 1-20. The invention is directed to, among other things, a disk array apparatus communicably connected to a host computer and/or another disk array apparatus incapable of establishing a direct connection with the host computer in which data coming from the host computer is stored in a storage region as a result of addition of a storage region of the disk array apparatus, the disk array apparatus comprising: a logical unit formation section for forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer; a data writing section for writing, to each of the logical units, data coming from the host computer and/or the another disk array apparatus; a first check section for checking a validity of a reading request coming from the host computer for reaching the data stored in the disk array apparatus and/or the another disk array apparatus; a data transfer section for, when the first check section determines that the data reading request is valid, transferring the data stored in each of the logical units to the host computer based on the data reading request; a second check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus; a pair forming section for forming the pair when the second check section determines that the instruction from the host computer is valid as a result of instruction check; and a copy section for, when the logical unit formed from the

storage region of the disk array apparatus is accessed by the host computer for writing, copying writing data to the other logical unit forming the pair with the logical unit, wherein utilizing an interrelation between information about the plurality of logical units and information about the storage region as the addition result, the copy section copies the writing data to any actual storage region of the another disk array apparatus.

The search of the above features was conducted in the following areas:
class 707, subclasses 202-204, class 709, subclasses 217, 219, class 711,
subclasses 111-114, 136, 154, 160-162 and 165 and class 714, subclasses 5-7.

Additionally, a computer database search was conducted on the USPTO system EAST.

(D) The following is a list of the references deemed most closely related to the subject matter encompassed by the claims:

<u>U.S. Patent Number</u>	<u>Inventors</u>
5,459,857	Ludlam et al.
5,581,724	Belsan et al.
5,742,792	Yanai et al.
6,356,977	Ofek et al.
6,557,089	Reed et al.
6,832,289	Johnson

<u>U.S. Patent Publication No.</u>	<u>Inventor(s)</u>
2003/0188114	Lubbers et al.
2004/0049643	Alavarez et al.

A copy of each of these references (as well as other references uncovered during the search) is enclosed in an accompanying IDS.

(E) It is submitted that the present invention is patentable over the references for the following reasons.

It is submitted that the cited references, whether considered alone or in combination, fail to disclose or suggest the invention as claimed. In particular, the cited references, at a minimum, fail to disclose or suggest another disk array apparatus incapable of establishing a direct connection with the host computer, and/or a logical unit formation section for forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer, and/or a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus, and/or prohibiting the second host computer to make an access to the another disk array apparatus until a process ends after started responding to the data reading request, and/or identifying information for a virtual device derived by

virtualizing the storage region of the disk array apparatus, and retaining a mapping table showing an interrelation between the virtual device and the storage region of the another disk array apparatus mapped to the virtual device.

All of the independent claims recite at least one of these features or this feature, if there is only one. In particular, independent claim 1 recites another disk array apparatus incapable of establishing a direct connection with the host computer, a logical unit formation section for forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer, and a second check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus. Independent claim 8 recites another disk array apparatus incapable of establishing a direct connection with the host computer, a logical unit formation section for forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer, and a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus. Independent claim 11 recites another disk array apparatus incapable of establishing a direct connection with the host computer, a logical unit formation section for forming a plurality of logical units from the storage region of the addition result to be

accessed by the host computer, and a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus. Independent claim 14 recites a logical unit formation section for forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer, a check section for checking a validity of an instruction coming from the first host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus, and a prohibition section for, when a reading request comes from the second host computer for the data stored in the disk array apparatus and/or the another disk array apparatus, prohibiting the second host computer to make an access to the another disk array apparatus until a process ends after started responding to the data reading request. Independent claim 17 recites another disk array apparatus incapable of establishing a direct connection with the host computer, forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer, and checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus. Independent claim 18 recites another disk array apparatus incapable

of establishing a direct connection with the host computer, a logical unit formation step of forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer, identifying information for a virtual device derived by virtualizing the storage region of the disk array apparatus, and retaining a mapping table showing an interrelation between the virtual device and the storage region of the another disk array apparatus mapped to the virtual device, and a check step of checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus. Independent claim 19 recites another disk array apparatus incapable of establishing a direct connection with the host computer, forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer, and checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus. Independent claim 20 recites a logical unit formation step of forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer, checking a validity of an instruction coming from the first host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus,

and when a reading request comes from the second host computer for the data stored in the disk array apparatus and/or the another disk array apparatus, prohibiting the second host computer to make an access to the another disk array apparatus until a process ends after started responding to the data reading request.

The references considered most closely related to the claimed invention are briefly discussed below:

U.S. Patent No. 5,459,857 (Ludlam et al.) discloses a fault-tolerant disk array data storage subsystem in which two interconnected, dynamically-mapped disk drive array data storage subsystems emulate the operation of two storage control units sharing a single extremely reliable physical disk drive. The apparatus operates independent of the host processor and mimics the operation of a single DASD device even though the data is stored on a plurality of devices located in two operationally independent but cooperatively operative data storage subsystems. Mapping tables are used to indicate the correspondence between the virtual device image presented to the associated host processor and the physical storage location on the plurality of disk drives in the redundancy group in which the associated data record is stored. This interconnection of the two data storage subsystems enables the host processor to access the data records even if one or more critical elements fail in the data storage subsystems or data channels that interconnect the host processor to the storage control units. The failure of a critical element is transparent to the host processor, since the data

can be accessed via another data access path without requiring the system operator to perform any manual intervention activities. (See, e.g., Abstract and column 1, line 60, through column 2, line 43.) However, unlike the present invention, Ludlam et al. do not disclose, at a minimum, a logical unit formation section for forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer, or a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus.

U.S. Patent No. 5,581,724 (Belsan et al.) discloses a memory control apparatus for a disk drive array data storage subsystem that employs a log-structured storage management approach that maintains data integrity while writing data to multiple open de-stage cylinders on the disk drives. The data storage subsystem dynamically maps a virtual data storage device image presented to associated processors to physical data storage devices used to implement the data storage subsystem. Multiple de-stage memory elements are concurrently active to increase an aggregate de-stage data transfer rate and to allow the data to be stored on various memory elements appropriate to the type of data contained in each stored virtual object. The data storage subsystem maintains mapping tables which indicate the mapping that takes place between the virtual device image as seen by the host processors and the actual physical devices on which the data is stored. In order to improve the performance of the

data storage subsystem, data that is modified by a host processor is not rewritten in its original storage location, since this would entail updating the redundancy data that is stored along with the data received from the associated data processor in the redundancy group. (See, e.g., Abstract and column 2, lines 2-64.) However, unlike the present invention, Belsan et al. do not disclose, at a minimum, a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus.

U.S. Patent No. 5,742,792 (Yanai et al.), discloses a system and method for automatically providing and maintaining a copy of mirrored data stored at a location that is geographically remote from the main storage device. The two data storage systems are interconnected by a data link for remote mirroring of data. Each volume of data is configured as a local, a primary in a remotely-mirrored volume pair, or a secondary in a remotely-mirrored volume pair. The system controls storing of primary data received from a primary host computer on a primary data storage system, and additionally controls the copying of the primary data to a secondary data storage system controller which forms part of a secondary data storage system, for providing a back-up copy of the primary data on the secondary data storage system, which is located in a geographically remote location from the primary data storage system. The high speed communication link also permits one data storage system to read or write data to

or from the other data storage system. (See, e.g., Abstract and column 2, line 29, through column 3, line 19.) However, unlike the present invention, Yanai et al. do not disclose, at a minimum, a second disk array apparatus incapable of establishing a direct connection with the host computer, or a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus.

U.S. Patent No. 6,356,977 (Ofek et al.) discloses a system and method for providing data migration between two data storage devices. The system includes a first data storage device and a second data storage device. The first and second data storage devices are connected as a composite storage device that is coupled to a host, network, or other data processing system. The second storage device includes a table which identifies data elements that have migrated over to the second data storage device from the first data storage device. If the data elements have migrated, the second storage device responds to the data transfer request independently of any interaction with the existing storage device. If the data elements have not migrated, the second storage device migrates the requested data elements and then responds to the data request and updates the data element map or table. When not busy servicing other requests, the second storage device operates in a background mode to migrate data elements so the data migration can occur concurrently with and transparently to system operations. (See, e.g., Abstract and column 2, line 19, through column 4, line 47)

However, unlike the present invention, Ofek et al. do not disclose, at a minimum, a second disk array apparatus incapable of establishing a direct connection with the host computer, or a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus.

U.S. Patent No. 6,557,089 (Reed et al.) discloses an automated, fault-tolerant method of creating a backup copy of a source direct access storage device volume by first performing an instant virtual copy with source volume identifier suspended, then creating a non-virtual (physical) backup copy from the instant copy with the source volume ID reintroduced. This creates an exact duplicate of the source volume with minimal impact on access to the source volume. Moreover, the resultant backup copy is less costly and error prone because it is created by a machine-automated process rather than various commands issued by a system administrator. (See, e.g., Abstract and column 2, line 64, through column 3, line 55.) However, unlike the present invention, Reed et al. do not disclose, at a minimum, a second disk array apparatus incapable of establishing a direct connection with the host computer, or a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus.

U.S. Patent No. 6,832,289 (Johnson) discloses a method and system for migrating data from a first disk storage subsystem to a second heterogeneous disk storage subsystem without interrupting access to the data and without requiring special hardware. The computer system has memory in a processor and a plurality of attached heterogeneous disk storage systems. Data is copied from a first disk storage subsystem to a second disk storage subsystem, of equal or greater capacity to the first subsystem. An application program is able to access the data on the first disk storage subsystem while the data is being copied. The volume of data on the second disk storage subsystem is identified, within the computer system, as the volume of data on the first disk storage subsystem after the data is copied. (See, e.g., Abstract and column 2, lines 57, through column 4, line 14.) However, unlike the present invention, Johnson does not disclose, at a minimum, a second disk array apparatus incapable of establishing a direct connection with the host computer, or a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus.

U.S. Patent Publication No. 2003/0188114 (Lubbers et al.) discloses a data replication method and system where both the source and destination data storage devices are virtualized at a system level such that both source and destination virtual disks are implemented by a plurality of physical storage devices. A storage cell and storage controller is implemented at each site and a

pool of physical storage is coupled to the controller. A copy set comprising a logical unit of storage in each of the storage cells is defined. As operational data transactions are performed to one of the members of a copy set, they are replicated in each other member of the copy set. Changes to dependent attributes of one member of a copy set are replicated to each other member of the copy set. Changes to independent attributes can be made independently of the other members of the copy set. (See, e.g., paragraphs 13-14, and 21.) However, unlike the present invention, Lubbers et al. do not disclose, at a minimum, a second disk array apparatus incapable of establishing a direct connection with the host computer, or a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus.

U.S. Patent Publication No. 2004/0049643 (Alvarez et al.) discloses a computer storage system that includes a first storage device and a second storage device, in which a controller performs data operations to copy data from the first storage device to the second storage device, so that a redundant copy is kept in the second storage device. The invention includes a method for receiving a request to perform a data operation; determining whether the request provokes a write operation on the storage device, and then writing the data to the first storage device and a copy of the data to the second storage device. (See, e.g., Abstract and paragraphs 10-11.) However, unlike the present invention, this

reference does not disclose, at a minimum, a second disk array apparatus incapable of establishing a direct connection with the host computer, or a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus.

Therefore, since the references fail to disclose another disk array apparatus incapable of establishing a direct connection with the host computer, and/or a logical unit formation section for forming a plurality of logical units from the storage region of the addition result to be accessed by the host computer, and/or a check section for checking a validity of an instruction coming from the host computer for forming a pair between, out of the plurality of logical units, the logical unit formed from the storage region of the disk array apparatus and the logical unit formed from the storage region of the another disk array apparatus, and/or prohibiting the second host computer to make an access to the another disk array apparatus until a process ends after started responding to the data reading request, and/or identifying information for a virtual device derived by virtualizing the storage region of the disk array apparatus, and retaining a mapping table showing an interrelation between the virtual device and the storage region of the another disk array apparatus mapped to the virtual device, it is submitted that all of the claims are patentable over the cited references.

CONCLUSION

Applicant has conducted what it believes to be a reasonable search, but makes no representation that "better" or more relevant prior art does not exist. The Patent Office is urged to conduct its own complete search of the prior art, and to thoroughly examine this application in view of the prior art cited herein and any other prior art that the Patent Office may locate in its own independent search. Further, while Applicant has identified in good faith certain portions of each of the references listed herein in order to provide the requisite detailed discussion of how the claimed subject matter is patentable over the references, the Patent Office should not limit its review to the identified portions but rather, is urged to review and consider the entirety of each reference, and not to rely solely on the identified portions when examining this application.

In view of the foregoing, Applicant requests that this Petition to Make Special be granted and that the application undergo the accelerated examination procedure set forth in MPEP 708.02 VIII.

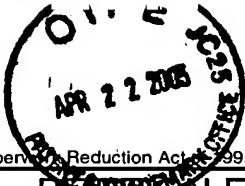
Respectfully submitted,

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.



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PTO/SB/30 (11-04)
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

PROCESSING FEE Under 37 CFR 1.17(f), (g) & (h) TRANSMITTAL (Fees are subject to annual revision) Send completed form to: Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450	Application Number	10/769,784
	Filing Date	February 3, 2004
	First Named Inventor	Ikuo URATANI et al.
	Art Unit	2183
	Examiner Name	Not yet assigned
	Attorney Docket Number	1309.43471X00

Enclosed is a petition filed under 37 CFR 1.102(d) that requires a processing fee (37 CFR 1.17(f), (g), or (h)). Payment of \$ 130.00 is enclosed.

This form should be included with the above-mentioned petition and faxed or mailed to the Office using the appropriate Mail Stop (e.g., Mail Stop Petition), if applicable. For transmittal of processing fees under 37 CFR 1.17(i), see form PTO/SB/17i.

Payment of Fees (small entity amounts are NOT available for the petition (fees))

- ☒ The Commissioner is hereby authorized to charge the following fees to Deposit Account No. 50-1417:
- ☐ petition fee under 37 CFR 1.17(f), (g) or (h) ☒ any deficiency of fees and credit of any overpayments
- Enclose a duplicative copy of this form for fee processing.
- ☐ Check in the amount of \$ _____ is enclosed.
- ☒ Payment by credit card (From PTO-2038 or equivalent enclosed). Do not provide credit card information on this form.

Petition Fees under 37 CFR 1.17(f):	Fee \$400	Fee Code 1462
For petitions filed under: § 1.53(e) - to accord a filing date. § 1.57(a) - to according a filing date. § 1.182 - for decision on a question not specifically provided for. § 1.183 - to suspend the rules. § 1.378(e) for reconsideration of decision on petition refusing to accept delayed payment of maintenance fee in an expired patent. § 1.741(b) - to accord a filing date to an application under §1.740 for extension of a patent term.		
Petition Fees under 37 CFR 1.17(g):	Fee \$200	Fee code 1463
For petitions filed under: §1.12 - for access to an assignment record. §1.14 - for access to an application. §1.47 - for filing by other than all the inventors or a person not the inventor. §1.59 - for expungement of information. §1.103(a) - to suspend action in an application. §1.136(b) - for review of a request for extension of time when the provisions of section 1.136(a) are not available. §1.295 - for review of refusal to publish a statutory invention registration. §1.296 - to withdraw a request for publication of a statutory invention registration filed on or after the date the notice of intent to publish issued. §1.377 - for review of decision refusing to accept and record payment of a maintenance fee filed prior to expiration of a patent. §1.550(c) - for patent owner requests for extension of time in <u>ex parte</u> reexamination proceedings. §1.956 - for patent owner requests for extension of time in <u>inter partes</u> reexamination proceedings. § 5.12 - for expedited handling of a foreign filing license. § 5.15 - for changing the scope of a license. § 5.25 - for retroactive license.		
Petition Fees under 37 CFR 1.17(h):	Fee \$130	Fee Code 1464
For petitions filed under: §1.19(g) - to request documents in a form other than that provided in this part. §1.84 - for accepting color drawings or photographs. §1.91 - for entry of a model or exhibit. §1.102(d) - to make an application special. §1.138(c) - to expressly abandon an application to avoid publication. §1.313 - to withdraw an application from issue. §1.314 - to defer issuance of a patent.		

Name (Print/Type)	Frederick D. Bailey	Registration No. (Attorney/Agent)	42,282
Signature		Date	April 22, 2005

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.